Prof. Dr. Barbara Di Ventura

Title:
Bye bye L-arabinose drive

Abstract:
Engineering methods to spatiotemporally control gene expression is one of the most important goals of synthetic biology. While temporal control of gene expression can be readily achieved with chemicals added to the cell population, only rather simple spatial control can be achieved this way. The rapidly emerging field of optogenetics offers the solution to this problem, because light is a perfect spatially and temporally confinable external trigger, enabling the regulation of the gene expression process down to individual cells within the population. During this talk, I will present a novel optogenetic system to control gene expression in bacteria called BLADE. I will explain the engineering concepts behind BLADE and showcase its utility to control the expression of genes with important biological functions. BLADE is based on the natural AraC transcriptional regulator and allows performing optogenetic experiments with previously constructed L-arabinose-responsive plasmids and strains. Therefore, we envisage that light will be more broadly adopted by bacteriologists, substituting L-arabinose as an inducer in at least some applications.

Biography:
Barbara gained a degree in Computer Science from the University of Rome “La Sapienza” after which she obtained a Ph.D. in molecular biology at the EMBL, Heidelberg. In 2011 she became the leader of the “Molecular and Cellular Engineering group” at the BioQuant center, at the University of Heidelberg, where she stayed until summer 2017. From September 2017, the group moved to the University of Freiburg, where Barbara is now full professor. Her team is interested in understanding the mechanisms used by cells to control processes in space and time using an interdisciplinary approach that combines molecular and cellular biology with synthetic biology and mathematical modeling. A special focus of the lab is optogenetics, that is, the use of light to externally control protein function and localization in individual living cells.